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Does Immediate Operation for Symptomatic Non-ruptured Abdominal Aortic Aneurysm Compromise Outcome?☆

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Background. *The optimum timing of surgery for acutely symptomatic abdominal aortic aneurysm (AAA) remains a clinical dilemma: should symptomatic aneurysm be operated on urgently for fear of impending rupture, or should there be a period of preoperative evaluation to optimise the patient's medical co-morbidity, with a consequent delay in surgery?*
Method. *Ninety-five patients were diagnosed with acutely symptomatic AAA (back pain, abdominal pain or a tender aneurysmal aorta) between 1995 and 2001 and included in a retrospective case-cohort study. The in-hospital mortality rates for patients undergoing early surgery (within 24 h of presentation) were compared to those of patients whose surgery had been delayed to allow further evaluation.*
Results. *Of 95 patients with an acutely symptomatic AAA, 70 had surgery within 24 h of admission. The remaining 25 underwent planned delayed surgery after a median of (range) three (2–17) days. The reasons for delay to AAA repair were primarily to allow further cardiorespiratory assessment and radiological imaging. In the early surgery group, there were six postoperative deaths (9%); in the group who were to have delayed surgery, there were three (12%) deaths (*$P = 0.694$*).*
Conclusion. *Early operation for acutely symptomatic AAA, in selected patients, is not associated with an excessive mortality rate compared to delayed operation.*

Keywords: Abdominal aortic aneurysm; Symptomatic; Outcome.

Introduction

Patients presenting with pain related to abdominal aortic aneurysm (AAA) but who are haemodynamically stable are a common surgical problem, not least with respect to the timing of operative intervention.[1,2] Advocates of immediate operative repair argue that these symptoms are due to acute aneurysmal expansion or imminent rupture and these patients should undergo surgery within 24 h of admission.[2–4] Others argue that those with a symptomatic, non-ruptured aneurysm, who are otherwise stable, may benefit from a period of preoperative evaluation and optimisation of any significant cardiac, respiratory or renal dysfunction.[5–7] Their contention is that early surgery in ill but haemodynamically stable patients carries an excessive mortality and that outcome is likely to be more favourable if the co-morbid factors are addressed preoperatively.[6,8]

The aim of this study was to compare the outcome of patients with acutely symptomatic AAAs with respect to early (<24 h) or delayed (>24 h) surgery.

Method

All patients admitted to the Edinburgh Vascular Surgical Service for repair of AAA over a 7-year period (January 1995 to December 2001) were identified from a prospectively gathered database and included in a retrospective observational study. The database, together with hospital records, provided demographic details, clinical and operative information for all patients admitted with acutely symptomatic AAA. An acutely symptomatic aneurysm was defined as severe back and/or abdominal pain, haemodynamic stability and a tender AAA on palpation. At operation, this group of patients had no evidence of a retroperitoneal and/or intraperitoneal blood. These patients were further classified as having

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undergone either early (<24 h) or delayed (>24 h) AAA repair. The authors have adopted a general policy of early operation on acutely symptomatic AAAs, i.e. within 24 h. However, patients who have significant co-morbidity or an uncertain diagnosis, have surgery delayed to allow further investigation and assessment. In-hospital morbidity and mortality and length of hospital stay were assessed for both cohorts of patients with acute symptomatic AAA.

Statistical analysis was performed using SPSS for Windows Release 11.0.0 (SPSS Inc., Chicago, IL, USA). The two groups (early versus delayed surgery) were compared statistically with respect to outcome. Differences between groups were determined by the χ^2 or Fisher's exact tests for categoric variables and Mann–Whitney U test for non-parametric continuous variables; $P \leq 0.05$ was considered significant.

Results

One hundred and twenty-one patients were admitted with acutely symptomatic AAA during the study period. Of these, 17 patients were deemed unsuitable for aortic surgery due to extensive co-morbidity or patient wishes and nine patients had spontaneous symptom resolution within 24 h of admission. The remaining 95 patients had acutely symptomatic AAA that were felt to be amenable to operative repair and are included in the present analysis.

There were 76 men and 19 women of median (range) age 71 (53–87) years. Seventy patients underwent surgery within 24 h of presentation (early surgery group) and 25 underwent planned, delayed surgery.

The median (range) age of patients undergoing early surgery and undergoing delayed operation was 71 (53–87) years and 71 (57–83) years, respectively, ($P=0.630$). Median (range) time to operation, in the delayed group, was three (2–17) days. The reasons for delay to operation are shown in Table 1. Of the 70 patients who underwent early operation, 15 had preoperative CT scanning. All 25 patients in the delayed group had CT or aortographic investigation preoperatively. Three patients in the delayed group suffered rupture of their AAA within 48 h of admission. Operation was delayed in these three patients because of active MRSA infection of a sternotomy wound in one patient, acute-on-chronic renal dysfunction in another and to allow further cardiorespiratory investigation in the final patient. Of these, two died without reaching the operating theatre and one survived repair of ruptured AAA. These patients have been included in the outcome analysis on an intention-to-treat basis.

Table 1. Reasons for delay to surgery in 25 patients

Cause of delay	Number of patients
Cardiac and respiratory assessment	21
Investigation of suspected oesophageal carcinoma	1
Investigation of suspected colorectal carcinoma	1
Active MRSA infection	1
Chronic renal failure	1

The present series has 25 patients in whom operation was delayed due to concerns regarding co-morbidity. In the vast majority of patients this was attributable to cardiorespiratory disease or related to a suspected malignancy and unclear diagnosis. These patients underwent preoperative CT imaging and cardiorespiratory assessment where appropriate. No patient who received cardiac and respiratory investigation required specialist cardiological or respiratory intervention. One patient was discovered to have severe aortic stenosis and another significant coronary artery disease on coronary angiography. In both cases, cardiology advice was to proceed with urgent aortic surgery, prior to any cardiac intervention, in view of the symptomatic AAA.

Eighteen (19%) of 93 patients who had attempted operative repair had evidence of an inflammatory AAA at laparotomy. In contrast, 36 (9%) of 407 ($P=0.003$) elective and 24 (8%) of 297 ($P=0.002$) ruptured AAA repairs, performed during the same period, were in patients with inflammatory AAA. Three patients in the early group did not undergo insertion of an aortic prosthesis at operation; repair in the absence of AAA rupture was felt to be contraindicated in one because of dense inflammatory change, in one because an inflammatory AAA co-existed with a rectal tumour, and in an 84-year old who had a supra-renal AAA. Of the 90 patients who underwent insertion of an aortic prosthesis, two (2%) required supra-renal clamping. Two patients in the early group required reoperation due to postoperative bleeding and one patient in the late group needed a return to theatre for evacuation of haematoma.

In-hospital mortality in the early group was six (9%) of 70 patients. Two deaths were within 24 h of surgery, and four occurred three or more days postoperatively. Among 25 patients who were planned for delayed surgery, there were two preoperative deaths due to AAA rupture and one postoperative death at day 6, yielding an overall AAA mortality rate of 12%. The postoperative death in the delayed group occurred in the patient shown to have severe coronary artery disease on preoperative angiography. There was no

significant difference in in-hospital mortality between early and delayed groups ($P=0.694$). Causes of death are shown in Table 2.

Of the 64 surviving patients in the early group, 38 (59%) developed one or more postoperative complication. In the delayed group, eight (36%) of 22 surviving patients developed one or more complication ($P=0.062$). Causes of postoperative morbidity are shown in Table 3.

Median (range) hospital stay in the early operative cohort was 12 (1–69) days compared to 13 (1–58) days for the delayed group ($P=0.422$).

Discussion

It is generally accepted that an acutely symptomatic, non-ruptured AAA should be repaired urgently. However, emergency surgery for symptomatic aneurysms may be associated with a high operative mortality and morbidity. There are few large series reporting management strategies and outcome in this group of patients.[6–9] The present retrospective study describes a single centre experience of such patients.

The management of an acutely symptomatic AAA depends on two key variables. Firstly, does the patient have a ruptured AAA requiring immediate surgery and, secondly, how significant is the patient's co-morbidity and can this be optimised to minimise perioperative risk? In the present series, symptoms of pain attributable to AAA and haemodynamic stability have been considered to represent a prerupture state, and the majority of such patients have been offered immediate surgery. Assessment was generally based on clinical grounds and performed by senior surgeons and anaesthetists.

Accurate clinical diagnosis to exclude aneurysm rupture is imperative in patients with symptomatic AAA. Immediate CT or aortography, to aid diagnosis, was performed in only 48 (40%) of the 121 patients admitted with symptomatic non-ruptured AAA. Although data from this centre have shown emergency CT scan to be an unreliable tool in differentiating ruptured from non-ruptured AAA in stable patients without a history of either collapse or hypotension, others have advocated the use of preoperative CT scanning for patients in whom the diagnosis of rupture is uncertain.[3,6,7,10] Patients with radiological confirmation of aneurysm rupture are offered immediate surgery, while those without rupture have a period of specific preoperative intervention to improve organ function.[8] Proponents of delayed surgery argue that, in general terms, emergency operations carry a higher mortality than elective procedures, irrespective of the underlying disease process.[8,11]

In the authors' experience, delay to surgery for symptomatic AAA may lead to rupture and subsequent death in a sub-group of patients. From the present data, aneurysm rupture occurred in three (12%) of the 25 patients who had surgery delayed for further investigation and assessment. The rupture-risk of symptomatic intact AAA, though uncertain, is significant. Therefore, it is the authors' opinion that early operative intervention should be recommended in patients with reasonable operative risk.

The present in-hospital mortality rates of 9 and 12% in the early and delayed cohorts, respectively, compare favourably to previous series reporting on open repair of symptomatic AAA (Table 4).[6–9] Importantly, no significant differences were identified in postoperative morbidity or total hospital stay.

Although the current data are uncontrolled and

Table 2. Causes of death in six patients undergoing early surgery and three delayed patients

Cohort	Patient	Cause of death
Early	1	Postoperative haemorrhage—Day 1
	2	Multi-organ failure—Day 1
	3	Multi-organ failure—Day 4
	4	Myocardial infarction—Day 5
	5	Multi-organ failure—Day 11
	6	Multi-organ failure—Day 36
Delayed	1	AAA rupture—Day2
	2	AAA rupture—Day 2
	3	Myocardial infarction—Day 6

Table 3. Number and type of postoperative complications in 38 patients undergoing early surgery and eight patients undergoing delayed surgery

Complication	38 Early patients	8 Delayed patients
Pneumonia/chest infection	14	3
Cardiac failure	8	
Arrhythmia	5	2
Acute renal failure	4	2
Wound infection	3	
Ileus	3	
Clostridium difficile colitis	3	1
Pulmonary embolus	3	1
Postoperative bleeding	2	1
Myocardial infarction	1	1
Spinal ischaemia	1	
Urinary tract infection	1	
Septicaemia	1	1
Oesophagitis	1	
Pancreatitis	1	
Limb ischaemia	1	

Table 4. Contemporary studies quoting outcome after open repair of symptomatic non-ruptured AAA

Reference	Year of publication	Number of patients	Postoperative mortality rate (%)
Sullivan *et al.*[8]	1990	19	26
Vohra *et al.*[9]	1991	37	24
Cambria *et al.*[6]	1994	36	11
Soisalon-Soininen *et al.*[7]	1999	110	18

retrospective, they do suggest that early surgery for selected patients with an acutely symptomatic AAA can be performed without significantly increased mortality when compared to patients who have surgery delayed in order to optimise co-morbid disease. The present data demonstrate that the outcome for patients with a symptomatic AAA is not prejudiced by rapid clinical assessment of suitability for immediate surgery. Reliance upon clinical assessment seems to constitute safe practice.

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